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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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NIXON & VANDERHYE, P.C.
1100 N. GLEBE ROAD
8TH FLOOR
ARLINGTON, VA 22201

EXAMINER

SINGH, DALIP K

ART UNIT	PAPER NUMBER
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2676

DATE MAILED: 06/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/726,215

Applicant(s)

FOULADI ET AL.

Examiner

Dalip K Singh

Art Unit

2676

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-81 is/are pending in the application.
- 4a) Of the above claim(s) 44-54 and 78-80 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-34, 36-43, 55, 56, 59-77 and 81 is/are rejected.
- 7) ☒ Claim(s) 35, 57 and 58 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 November 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5, 6
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-43, 55-77 and 81 drawn to a computer graphics display memory system classified in class 345, subclass 546.
 - II. Claims 44-54 drawn to a method of controlling the flow of graphics data, setting a breakpoint and reading graphics data from the buffers in a predetermined order classified in class 345, subclass 558.
 - III. Claims 78-80 drawn to a method of generating data structures signifying the beginning of a display list, redirecting the graphics command stream to a display list buffer classified in class 345, subclass 553.
2. The inventions are distinct, each from the other because of the following reasons:

Inventions I, II and III are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, **invention I** has separate utility such as **computer graphics display memory system** without requiring **invention II** which is about **controlling the flow of graphics data, setting a breakpoint and reading graphics data from the buffers in a predetermined order**; or without requiring **invention III** which is about **generating data structures and redirection of data to a display list buffer**. See MPEP § 806.05(d).
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. Examiner in a telephonic interview with Attorney of Record: Robert W. Faris (Reg. No. 31,352) reached an agreement regarding Election/Restrictions requirement as detailed above

with applicant electing Group I drawn to claims 1-43, 55-77 and 81 **without traverse** while **withdrawing** claims 44-54 and 78-80 drawn to Group II and Group III, respectively.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claim 12 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 12 limitation recites buffer providing linear first-in-first-out access but the specification does not provide any information or discussion about linear first-in-first-out access. For the purposes of examination, linear first-in-first-out access would be treated as circular first-in-first-out access.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claim(s) 1-4, 7, 9, 10, 11-18, 30-32, 36-38, 55, 56, 60-62, 66-77, 81 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,112,267 to McCormack et al.

a. Regarding claim 1, McCormack et al. **discloses**: a producer (processor 300, Figure 1a) that outputs graphics commands, a consumer (graphics processor 700, Figure 1a) that consumes the graphics commands outputted by the producer (processor 300, Figure 1), and a storage device (main memory 200, cache memory 310, off-chip cache

400) coupled between the producer (processor 300, Figure 1) and the consumer (graphics processor 700, Figure 1), the storage device (main memory 200, cache memory 310, off-chip cache 400) storing at least one buffer (third ring buffer 212) receives and temporarily stores graphics commands outputted by the producer (processor 300, Figure 1a) for delivery to the consumer (graphics processor 700, Figure 1) (...the processor 300 generates data to be...read by the graphics device 700...col. 7, lines 60-67), wherein the producer (processor 300, Figure 1a) and the consumer (graphics processor 700, Figure 1) are capable of accessing said buffer (third ring buffer 212) independently of one another (...the processor 300 can write data to buffers 312, 412 or 212...the graphics device 700 can read data from buffers 312, 412 or 212...the dynamic and independent functioning of steps 900 and steps 800 permits...the...writes...and reads...col. 8, lines 5-25).

b. Regarding claim 2, McCormack et al. **discloses** wherein the producer (processor 300) and the consumer (graphics processor 700) have independent read and/or write pointers (head pointers 726 & 736, tail pointers 728 & 736, Fig. 3a).

c. Regarding claims 3-4, McCormack et al. **discloses** wherein the storage device (main memory 200, cache memory 310, off-chip cache 400) stores plural variable sized buffers (a first ring buffer 312, second ring buffer 412, third ring buffer 212) disposed at selected locations within the storage device (...a first ring buffer 312...fit in the on-chip cache 310...a second ring buffer 412...a third ring buffer 212...col. 6, lines 10-31) each of which can be independently accessed by the producer (processor 300) and/or the consumer (graphics processor 700) (...the processor 300 can write data to buffers 312, 412 or 212...the graphics device 700 can read data from buffers 312, 412 or 212...the dynamic and independent functioning of steps 900 and steps 800 permits...the...writes...and reads...col. 8, lines 5-25).

- d. Regarding claim 7, it is similar in scope to claim 2 and is rejected under the same rationale.
- e. Regarding claim 9, McCormack et al. **discloses** consumer (graphics processor 700, Figure 1) (...the processor 300 generates data to be...read by the graphics device 700...col. 7, lines 60-67) to consume a set of graphics commands (...the buffer 312 fills data written by the processor 300...the graphics device 700 must read all of the data from the buffer 312 before reading any data from the buffer 412...col. 12, lines 1-20) the producer stores elsewhere within the storage device (...before reading any data from the buffer 412...col. 12, lines 15-20), and to resume consuming graphics commands from the first buffer after consuming the graphics commands stored elsewhere.
- f. Regarding claims 10 and 66, McCormack et al. **discloses** read command specifying a starting address (...the graphics device ...commences reading data from the buffer...starting at the address given by the head pointer 736...col. 12, lines 35-37) and **implicitly discloses** a length of a display list.
- g. Regarding claims 11 and 12, McCormack et al. **discloses** the buffer providing circular first-in-first-out access (...the plurality of buffers can be configured as ring buffers...col. 5, lines 35-40).
- h. Regarding claims 13 and 69, McCormack et al. **implicitly** discloses wherein the buffer can be selectively attached to both the producer and the consumer simultaneously (...the use of multiple buffers and the dynamic switching between buffers enhances the flow of data from the processor, via the buffers, to the I/O device...col. 5, lines 3-6).
- i. Regarding claims 14-18, McCormack et al. **discloses** use of multiple buffers and the dynamic switching between buffers which enhances the flow of data from the processor, via the buffers, to the I/O device (col. 5, lines 3-6).

j. Regarding claims 30-31, McCormack et al. **discloses** wherein the producer comprises a processor (processor 300, Figure 1a) and the consumer comprises a graphics processor (graphics processor 700, Figure 1a) including a graphics pipeline. the storage device comprises a main system memory (main memory 200, cache memory 310, off-chip cache 400), and the producer dynamically allocates said buffer within the main system memory (...the use of multiple buffers and the dynamic switching between buffers enhances the flow of data from the processor, via the buffers, to the I/O device...col. 5, lines 3-6).

a. Regarding claim 32, it is similar in scope to claim 2 above and is rejected under the same rationale.

k. Regarding claim 36, it is similar in scope to claim 2 above and is rejected under the same rationale.

l. Regarding claim 37, it is similar in scope to claim 1 above and is rejected under the same rationale.

m. Regarding claim 38, it is similar in scope to claim 2 above and is rejected under the same rationale.

n. Regarding claim 55, it is similar in scope to claim 1 above and is rejected under the same rationale.

o. Regarding claim 56, official notice is taken that both the concept and advantage of circular buffer in general is well known and expected in the graphics/data processing art.

p. Regarding claim 60, it is similar in scope to claim 4 above and is rejected under the same rationale.

- q. Regarding claim 61, it is similar in scope to claim 5 above and is rejected under the same rationale.
- r. Regarding claim 62, it is similar in scope to claim 2 above and is rejected under the same rationale.
- s. Regarding claim 65, it is similar in scope to claim 9 above and is rejected under the same rationale.
- t. Regarding claim 67, it is similar in scope to claim 11 above and is rejected under the same rationale.
- u. Regarding claim 68, it is similar in scope to claim 12 above and is rejected under the same rationale.
- v. Regarding claim 70, it is similar in scope to claim 14 above and is rejected under the same rationale.
- w. Regarding claim 71, it is similar in scope to claim 15 above and is rejected under the same rationale.
- x. Regarding claim 72, it is similar in scope to claim 16 above and is rejected under the same rationale.
- y. Regarding claim 73, it is similar in scope to claim 17 above and is rejected under the same rationale.
- z. Regarding claim 74, it is similar in scope to claim 18 above and is rejected under the same rationale.
- aa. Regarding claim 75, it is similar in scope to claim 32 above and is rejected under the same rationale.
- bb. Regarding claim 76, it is similar in scope to claim 55 above and is rejected under the same rationale.

cc. Regarding claim 77, it is similar in scope to claim 10 above and is rejected under the same rationale.

dd. Regarding claim 81, it is similar in scope to claim 76 above and is rejected under the same rationale.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 5, 6, 8, 33, 34, 39-41, 59, 63 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,112,267 to McCormack et al. in view of U.S. Patent No. 6,470,403 B1 to Houg.

a. Regarding claim 5, McCormack et al. **discloses** plural buffers in the form of ring buffers. McCormack et al. **teaches** data writes by the processor and data reads by the graphics device to be simultaneously directed at different buffers located at different levels in the memory hierarchy (col. 4, lines 60-67). These plurality of buffers are preferentially selected as write buffers to store data transmitted by the processor (col. 5, lines 19-23). The graphics device 700 (consumer) always reads data from the presently active buffer. Fig. 3a shows locations in ring buffer locations containing data awaiting a read by the graphics device 700 (consumer); and other locations available for data writes by the processor 300 (producer). Processor 300 (producer) and the graphics device 700 (consumer) utilize head pointers and tail pointers similar to the write pointer for determining quantity of data in a buffer (col. 7, lines 45-60). Further, data reads by the graphics device 700 and data writes by the processor 300 as shown in Fig. 5 and Fig. 6

function separately (col. 8, lines 26-36). Therefore, McCormack et al. **establishes** that some plurality of buffers are reserved for writes by the producer only and some for reads only by the consumer. McCormack et al. **is silent about** maintaining an independent read and write pointers. Houg **discloses** independent read and write pointers (col. 3, lines 6-20). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify McCormack's "read buffers that are separated from the write buffers" with the feature "independent read and write pointers" as taught by Houg **because** it is an efficient way of preventing overflow or underflow of buffers (col. 2, lines 65-67).

b. Regarding claim 6, McCormack et al. as modified by Houg **discloses** wherein the consumer (graphics processor 12, Figure 1) selectively increments the consumer write pointer (112a, Houg:col. 3, lines 6-20) in response to the producer (host processor 10, Figure 1) writing to the active buffer the **motivation** for doing being preventing overflow or underflow of buffers (Houg: col. 2, lines 65-67).

c. Regarding claim 8, wherein the consumer increments the consumer read pointer, and suspends reading from the active buffer when the incremented consumer read pointer has a predetermined relationship with the consumer write pointer, the specification discloses on pages 22-24 that once the write pointer encounters the read pointer, it ceases writing to avoid overwriting valid data or in other words buffer has been read completely. McCormack et al. as modified by Houg **discloses** read pointer incrementing as the consumer reads, and suspending reading from the buffer based on a predetermined relationship with the consumer write pointer (...as information is read from the...buffer...the read pointer...advances until it may catch up with the write pointer...at which time...buffer...is empty...col. 3, lines 18-20). Therefore, it would have been obvious to a person of ordinary skill in the art at the time was made to modify

McCormack et al. with the feature “read pointer reading, suspending reading based on a predetermined relationship with write pointer” as taught by Houg **because** FIFO buffer has been emptied and thus prevents underflow condition (col. 3, lines 65-67).

d. Regarding claim 33, it is similar in scope to claim 8 above and is rejected under the same rationale.

e. Regarding claim 34, it is similar in scope to claim 6 above and is rejected under the same rationale.

f. Regarding claim 39, it is similar in scope to claim 8 above and is rejected under the same rationale.

g. Regarding claim 40, it is similar in scope to claim 8 above and is rejected under the same rationale.

h. Regarding claim 41, it is similar in scope to claim 5 above and is rejected under the same rationale.

i. Regarding claim 59, it is similar in scope to claim 5 above and is rejected under the same rationale.

j. Regarding claim 63, it is similar in scope to claim 8 above and is rejected under the same rationale.

k. Regarding claim 64, it is similar in scope to claim 6 above and is rejected under the same rationale.

11. Claims 19-23 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,112,267 to McCormack et al. as applied to claim 1 above, in view of U.S. Patent No. 6,674,805 B1 to Kovacevic.

a. Regarding claims 19-23, McCormack et al. is **silent** about buffer having a maximum size, the producer setting the size of the buffer, dynamically sizing up the

buffer to store a frame of graphics commands, producer declaring the buffer by issuing a graphics buffer initialization command specifying buffer starting address and buffer length, buffer length being a multiple of 32 bytes and having a minimum size of 64 KB, and wherein the producer may write a breakpoint into the buffer that suspends graphics commands upon encountering the breakpoint. Kovacevic et al. **discloses** use of system circular buffers wherein the host processor (producer) specifies buffer start address and length of the buffer (col. 20, lines 15-23). Kovacevic et al. **teachings** are therefore taken in the context of ring buffer management in a graphics system and therefore cover the limitations wherein buffer maximum size, sizing up the ring buffer to accommodate a frame of graphics commands, buffer starting address and buffer length, and **implicitly** also cover buffer length of a certain multiple of bytes with minimum size. Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to modify McCormack et al. with the feature “physical memory location and size of the ring buffer” as taught by Kovacevic et al. **because** it provides for efficient ring buffer management.

b. Regarding claim 37, it is similar in scope to claims 17-23 above and is rejected under the same rationale.

12. Claim(s) 24 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,112,267 to McCormack et al. as applied to claim 1 above, in view of U.S. Patent No. 6,674,805 B1 to Kovacevic and further in view of U.S. Patent No. 5,754,839 to Pardo et al.

a. Regarding claims 24 and 42, McCormack-Kovacevic combination **is silent** about producer writing a breakpoint into the buffer resulting in suspension of graphics commands being consumed by consumer. Pardo et al. **discloses** storing breakpoint information in history buffer. Pardo et al. **is dealing** with implementation of watchpoints and breakpoints in a data processing system, and it can be argued that it is

not relevant to the instant claim limitation, but Pardo et al. **does disclose** writing of a breakpoint into a buffer and is therefore pertinent to the instant claim. Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to modify McCormack-Kovacevic combination with the feature "breakpoint written into a buffer resulting "in suspension of commands"" as taught by Pardo et al. **because** it results in efficient program handling of processing system (col. 8, lines 53-56).

13. Claims 25-29 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,112,267 to McCormack et al. as applied to claim 1 above, in view of U.S. Patent No. 6,038,619 to Berning et al.

a. Regarding claims 25-29, McCormack et al. **is silent** in describing the details of buffer management as far as overflow status indicator, status registers, pointer positions, buffer overflow, flow control logic to prevent writes from overrunning reads; wrapping read and write pointers from a last location to a first location. Berning et al. **discloses** management of a circular buffer while overflowing and underflowing, pointer increments, direction of closure between pointers, taking care reading pointer is not overtaking the writing pointer (col. 5, lines 54-67; col. 6, lines 1-8). Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to modify McCormack et al. with the feature "circular buffer overflow and underflow management" as taught by Berning et al. **because** it results in efficient circular buffer performance.

b. Regarding claim 43, it is similar in scope to claim 25 above and is rejected under the same rationale.

Allowable Subject Matter

14. Claim(s) 35, 57 and 58 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Dalip K. Singh** whose telephone number is **(703) 305-3895**. The examiner can normally be reached on Mon-Thu (8:00AM-6:30PM) Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Matthew Bella**, can be reached at **(703) 308-6829**.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

dk

June 12, 2004



**MATTHEW C. BELLA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600**